Sowjanya Gollapinni

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Education

- Ph.D. Physics**,** Wayne State University, Detroit, August 2012.
- M.S. Physics, Wayne State University, Detroit, September 2009.
- M.Sc. Physics with specialization in Particle Physics*,* University of Hyderabad (India), June 2005.
- B.Sc. (Physics, Mathematics and Computer science), Sri Venkateswara University (India), May 2003.

Employment

- Assistant Professor, August 2016 – Present, University of Tennessee, Knoxville
- Post-doctoral Research Associate, October 2012 – July 2016, Kansas State University.
- Graduate Research Assistant, Summer 2009 – September 2012, Wayne State University.
- Graduate Teaching Assistant**,** Fall 2007 – Winter 2009, Wayne State University.

Fellowships, Awards and Scholarships

- Intensity Frontier Fellow, Fermilab, 2015.
- Dissertation Fellowship, Wayne State University, 2012.
- Universities Research Association (URA) Visiting Scholar Award, Fermilab**,** 2011.
- 5th CERN-Fermilab Hadron Collider Physics Summer School Scholarship, Fermilab, 2010.

Collaboration Membership (Past and Present)

- CMS, MicroBooNE, SBND, DUNE

Research experience

- **Research Associate, Kansas State University (Oct. 2012 – present)**

  MicroBooNE experiment:

  MicroBooNE is a 170 ton Liquid Argon Time Projection Chamber (LArTPC) located along the Booster Neutrino Beam-line (BNB) at Fermilab. MicroBooNE finished commissioning in Summer 2015 and is taking data with the BNB since October 2015. The two main goals of MicroBooNE are to investigate the low-energy electromagnetic excess observed by the MiniBooNE experiment and precisely measure neutrino interaction cross-sections on Argon in the energy range of ~1 GeV.

Neutrino cross-section analyses: I convene the group performing neutrino-nucleus cross-section measurements which provide crucial inputs to current and future oscillation experiments. LArTPCs, given their fine granularity and capability to reconstruct energies down to very low thresholds, are ideal for these measurements. Achieving this goal requires almost 100% cosmic rejection efficiency, excellent interaction vertex resolution and particle identification. I made significant contributions in developing analysis techniques for charged-current (CC) inclusive neutrino-argon cross-section analysis which is one of the first results that will come out of MicroBooNE. A Monte Carlo study showing the performance of MicroBooNE for an early ν_μ CC inclusive analysis has been made public.

Detector Controls and Monitoring: The detector controls and monitoring system of MicroBooNE controls and monitors all elements of the experiment: Cryogenic system, Data Acquisition System, all electronic racks, power supplies and neutrino beam just to name a few. All important parameters that ensure safe running of the detector are monitored, for example, current, voltage and corresponding trip points are read-out in the case of power supplies, Argon purity levels and cryogenic temperatures are continuously monitored as part of cryogenics monitoring, fan speeds and rack temperatures are monitored to ensure rack safety and protection. Monitoring tools are critical for successful operation and commissioning of the MicroBooNE detector. I successfully designed and developed the MicroBooNE detector controls and monitoring system. I also installed and commissioned this system with great success.

Detector Calibration studies: There are various factors that can affect the electron signals in a LArTPC such as Ar purity, diffusion, and space charge accumulation. Electro-negative impurities in Ar can absorb the ionization electrons causing signal attenuation. Diffusion affects both drift time and spatial resolution of the signal. Currently, I am developing data-driven techniques to measure Ar purity and diffusion using the cosmic data collected recently by MicroBooNE.

Cosmogenic backgrounds and mitigation: Cosmic backgrounds are a great concern for surface-based LArTPCs such as MicroBooNE. As the convener of the Cosmogenics task force group, I led a team of postdocs and students to understand the size of various cosmic backgrounds expected in the detector and their impact on neutrino data and develop powerful techniques to reject these worrisome backgrounds. In my direction, the team also addressed the important question of whether MicroBooNE would require an overburden or not. Special focus was given to estimating the cosmic electromagnetic background which is crucially important for single e/γ searches and to address the low energy excess observed by the MiniBooNE experiment.

Software and Analysis Tools: I co-lead the development of software and analysis tools for efficient data production and analysis at MicroBooNE. These tools are currently adopted by other experiments such as SBND and 35-ton. I was also the first to develop an automated reconstruction validation package and tools necessary to understand particle track reconstruction efficiencies and optimization in MicroBooNE.

Active role in the MicroBooNE Construction, Installation and commissioning: I participated in the construction of the MicroBooNE detector as one of the core members who installed the ~8000 150 μm thick wires on to the TPC frame. I was also one of the core members who measured the tension of the wires before the TPC was moved to the experimental site. I also played an important role in the hardware installation for the experiment and documented several hardware and power supply procedures which are currently followed by the experiment.

Leadership Positions in MicroBooNE:

- Co-convener, *MicroBooNE Neutrino Cross-section Physics group,* Sept. 2015 – present
- Sub-system expert, *Detector Controls and Monitoring*, November 2015 – present
- Convener, *MicroBooNE Cosmogenics physics group,* July 2014 – July 2015
- *Convener, MicroBooNE monitoring and control system* development and Commissioning, Jan. 2014 – October 2015
- *Co-convener,* MicroBooNE S*oftware tools group,* June 2013 – present

Short-Baseline Near Detector (SBND) experiment:

The SBN program at Fermilab builds upon the already existing MicroBooNE detector by adding additional detectors along the BNB. SBND with 112 tons of active LAr mass will sit closest to the Booster Neutrino source at 110 m. The design philosophy of SBND is to serve as a prototype for the Deep Underground Neutrino Experiment (DUNE) Far detector. The SBND technology builds on many years of LArTPC R&D from ICARUS, ArgoNeuT, MicroBooNE and the DUNE 35-ton experiments. The SBND construction is expected to start towards the end of this year and early next year at Fermilab. One of the important physics goals of SBND is to characterize the intrinsic BNB content before any oscillations occur and help resolve the MiniBooNE low-energy excess.

Leadership Position(s) in SBND:

- L3 Manager, *SBND Hardware Installation and Detector Controls and Monitoring,* Nov. 2015 – Present

- **Graduate research assistant, Wayne State University (May 2008 – Aug. 2012)**

Search for Contact Interactions in the Di-muon Channel at CMS (Ph.D thesis):

Thesis advisor: Prof. Paul E. Karchin

The proliferation of quarks and leptons has naturally motivated the speculation that they may be composite structures of more fundamental constituents. For parton interaction sub-energies that are much less than the compositeness energy scale, the new force manifests itself in the form of a flavor-diagonal contact interaction. Experimentally, the cross-section for high-mass opposite-sign di-muon pairs produced in high energy hadron collisions deviates from the Standard Model (Drell-Yan) prediction. Based on 5.3 inverse femto-barns of proton-proton collision data at a center-of-mass energy of 7 TeV collected by the Compact Muon Solenoid (CMS) experiment in the year 2011, I set much improved limits on the compositeness scale.

CMS Muon Spectrometer performance studies:

Cathode Strip Chambers (CSCs) are located in the End-cap region of the CMS detector and provide efficient detection of muons. I studied a specific problem encountered during muon-like track reconstruction investigating why some muon signals are lost within the cathode strip chamber layers during track reconstruction. This study discovered a bug in the pattern recognition algorithm of the track reconstruction software that was causing a failure even when good signals are present in the CSC segments. This study prompted significant improvements to the track reconstruction algorithms.

Teaching Experience

- Taught Undergraduate laboratories, graded lab reports and proctored exams at Wayne State University (2007 – 2009)
  - PHY 2131 (General Physics Lab) – Fall 2007, Winter 2008, Fall 2008.
  - PHY2141 (Electromagnetism Lab) – Winter 2009.
- Taught Physics, mathematics and computer science to high-school and undergraduate students during my Bachelors and Masters in India.

Mentoring Experience

- Currently mentoring two physics graduate students from Kansas State University
  - **Varuna Meddage (Summer 2014 – present)**
    Inclusive Kaon Production at MicroBooNE and detector calibration studies

Software skills

- Proficient in C, C++, ROOT, Python, PyROOT, FORTRAN, MATLAB
- Good working knowledge in UNIX/LINUX and shell scripting
- EPICS, EPICS CSS, NetSNMP

Selected Talks and Posters

Conference presentations

- *Neutrino-nucleus interactions with LArTPCs,*
  Invited talk, Neutrino Workshop (as part of Neutrinos in Nuclear Physics, NS2016 conference), Oakridge National Laboratory, Knoxville, TN, July 30, 2016.
- *Neutrino Cross sections: Current Status and Impact on Oscillation measurements,*
  ***Invited Plenary talk**, NuHorizons 2016, Harish Chandra Research Institute (HRI), Ahmedabad, India, March 19, 2016.*
- *Neutrino Cross section Future*,
  Invited Plenary talk, Prospects in Neutrino Physics (NuPhys 2015), London, Dec. 16–18, 2015.
- *Accelerator-based Short-Baseline Neutrino Oscillation Experiments*,
  Invited talk, Twelfth Conference on the Intersection of Particle and Nuclear Physics (CIPANP 2015), Vail Colorado, May 19 – 24, 2015.
- *Prospects of making low-energy neutrino cross-section measurements at MicroBooNE*, **Invited talk**, Ninth International Workshop on Neutrino-Nucleus Interactions in the few-GeV region (NuInt14), London, May 19 – 24, 2014.
- *Results of Contact Interactions Search in Di-muon Final states at CMS using 2011 data*,
  Phenomenology 2012 Symposium (PHENO2012), Pittsburgh, May 7 – 9, 2012.
- *Search for Contact Interactions in the Di-muon channel in p-p collisions at CMS*,
  April meeting of American Physical Society (APS), Atlanta, Georgia, March 31 – April 3, 2012.

Colloquium and Seminar talks

- *MicroBooNE: Marking a Nu era in precision neutrino physics,*
  HEP Seminar, Brookhaven National Laboratories, July 15, 2016.
- Hunting for *Nu* Physics with Liquid Argon Detectors,
  Physics Colloquium, University of Mississippi, Oxford, March 7, 2016.
- Neutrino Physics with Liquid Argon Detectors,
  Physics Colloquium, University of Tennessee, Knoxville, March 3, 2016.
- *Hunting for Nu Physics with Liquid Argon Detectors,*
  HEP seminar, University of Pittsburgh, December 9, 2015.
- *The MicroBooNE LArTPC: Status and physics goals*,
  Physics Colloquium, Northern Illinois University, March 28, 2014.
- *The MicroBooNE experiment at Fermilab*,
  HEP seminar, University of Kansas, March 13, 2014.
- *The status of the MicroBooNE experiment*,
  HEP seminar, Kansas State University, March 12, 2014.

Public talks

- *Chasing the Secrets of the Ghostly Neutrino,* **BWIS Colloquium talk** sponsored by Brookhaven Women in Science (BWIS), Brookhaven National Laboratories, July 14, 2016.
- *Neutrino Physics,* Fermilab's Saturday Morning Physics Lecture for High-school and Middle-school kids*,* Fermilab, April 16th, 2016.
- *Neutrino Physics,* Fermilab's Saturday Morning Physics Lecture for High-school and Middle-school kids*,* Fermilab, February 6th, 2016.
- *Neutrino Physics with Liquid Argon Detectors*, **guest speaker**, 6th Annual Graduate Research Day, Department of Physics, Wayne State University, April 17, 2015.
- *Status of the MicroBooNE experiment*,
  Fermilab All Experimenters' Meeting, Fermilab, November 11, 2013.
- *Contact interactions in the di-muon channel at CMS*,
  DOE visit of Simona Roli to LPC, Fermilab, June 8, 2012.

Poster presentations

- *Contact interactions at CMS*,
  USCMS collaboration meeting, Boulder, Colorado, May 16 – 19, 2012.
- *Searching quark and lepton sub-structure at CMS*,
  2010 US LHC users' meeting (USLUO2010), Fermilab, October 28 – 30, 2010.
- *Contact interactions and Di-muon production at LHC*,
  USCMS collaboration meeting, Brown University, Providence, May 6 – 8, 2010

Outreach activities

- Panelist, S*TEM Career Expo for High School students*,
  Fermilab, April 20, 2016.
- Several *Meet a Scientist Q&A sessions for High school and college tour groups,*
  Fermilab
- Panelist, *2015 Annual Career Conference for High school students*,
  University of Chicago, Illinois, May 9, 2015.
- Panelist, S*TEM Career Expo for High School students*,
  Fermilab, April 22, 2015.
- Workshop leader for middle-school girls, *Expand Your Horizons (EYH 2015)*,
  University of Illinois, Chicago, March 28, 2015.
- Workshop mentor for high school girls, *Introduce a Girl to Engineering Day (IGED 2015)*,
  Argonne National lab (ANL), February 26, 2015.

Primary References

- **Prof. Paul E. Karchin (Ph.D advisor)**
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  Wayne State University
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  Kansas State University
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  Manhattan, KS 66506
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- **Prof. Bonnie Fleming (MicroBooNE Co-Spokesperson)**
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More references are available upon request.